GENERAL SPECIFICATIONS FOR MACHINERY

Bureau of Engineering, Navy Department

SUBSECTION S1-1 PLANS

1 December 1936

(Superseding Subsection S1-1, Plans, dated 1 July 1933)

NOTE.- Plans for the machinery, electrical equipment, and accessories of vessels building for the Navy are always of a confidential nature. Care shall be observed that they do not fall into the hands of unauthorized persons, especially those not citizens of the United States.

The following is quoted from an act approved June 15, 1917:

"* * * whoever, lawfully or unlawfully, having possession of, access to, control over, or being intrusted with any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, instrument, appliance, or note relating to the national defense, willfully communicates or transmits or attempts to communicate or transmit the same to any person not entitled to receive it, or willfully retains the same and fails to deliver it on demand to the officer or employee of the United States entitled to receive it; or whoever, being intrusted with or having lawful possession or control of any document, writing, code book, signal book, sketch, photograph, photographic negative, blueprint, plan, map, model, note, or information, relating to the national defense, through gross negligence permits the same to be removed from its proper place of custody or delivered to anyone in violation of his trust, or to be lost, stolen, abstracted, or destroyed, shall be punishable by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. * * * "

S1-1-a. GENERAL REQUIREMENTS.

Reference: (a) Federal Specifications CCC-C-531, Tracing Cloth.
(b) List of Bureau standard plans, see Appendix I.

1. All drawings of machinery and accessories under the cognizance of the Bureau of Engineering, which shall be furnished by and at the expense of the contractor, are grouped under the following general classification:

(a) Type A drawings.- Preliminary drawings, submitted with bids or prior to award of contract.

(b) Type B drawings.- Development or working drawings, submitted for approval subsequent to award of contract, but prior to ordering material or commencing work.

(c) Type C drawings.- Drawings prepared during the progress of work to accompany orders on sub-contractors, particularly orders for steel castings and forgings.
(d) Type D drawings.- Finished drawings, submitted after work is completed.
(e) In addition to the foregoing, instruction books and pamphlets, plans, and data incorporated in Booklet Plans of Machinery and Record of Electrical Installation shall be supplied as hereinafter described.

2. The Bureau's approval of any type of plan shall not relieve a contractor of any material or performance obligation under the contract, unless a question in regard thereto has been brought to the Bureau's attention in writing, and specific waiver of such requirement by the Bureau has been obtained, see Section A-1. All discrepancies discovered in drawings, in specifications, or between drawings and specifications, shall be immediately referred to the Bureau for action.

3. Drawings need not necessarily be made to scale, but, where practicable, scaled drawings are preferred. When drawings are not made to scale, such fact shall be clearly stated in the drawing title. In all cases figured dimensions of all parts shall be complete and shall include manufacturing tolerances, working fits, and surface finish, wherever applicable. All dimensions shall be given in feet, inches, and decimals or fractions of inches. Dimensions which apply to fitted parts shall be given in inches and fractions of inches with tolerances in decimal fractions; dimensions of nonfitted parts may be given in inches and decimal or common fractions; dimensions greater than 24 inches may be given in feet, inches, and fractions thereof. Where drawings are made to scale one of the following standard scales shall be used.

1/16 inch to the foot.
1/8 -inch to the foot.
1/4 -inch to the foot.
3/8 -inch to the foot.
1/2 -inch to the foot.
3/4 -inch to the foot.
1 -inch to the foot.
1-1/2 inches to the foot.
3 inches to the foot.
6 inches to the foot.
Full size.

4. The following plans shall be drawn to scales as indicated, but larger scales are preferred when their employment will not unduly increase the dimensions of the sheet:

(a) General layout plans of machinery installations of not less than one quarter inch to the foot.

(b) Piping layout plans for machinery spaces not less than three eighths inch to the foot.

(c) Electrical wiring layout plans for the entire vessel shall be made with decks and other structural features drawn to a scale of not less than one quarter inch to the foot.

5. All dimensions shall be so placed on drawings that they may be read either from the bottom of the sheet or from the right-hand side.

6. Salient features of the design and performance characteristics of all apparatus shall be prominently shown on every drawing where applicable. Such features shall include:

(a) Power input - Pounds of steam per hour, kilowatts per hour, pounds of oil per hour, etc.

(b) Power output (normal rated and overload) - Horsepower, kilowatts, gallons per minute, etc.

(c) Pressure - Steam, exhaust, suction, discharge, test, bearing, voltage, etc.

(d) Speed - Revolution or double strokes per minute, feet per second, bearing or journal surface speed, etc.

(e) Velocity (steam, liquid, air) - Through pipes and orifices, peripheral, etc.

(f) Temperature (inlet and outlet) - Steam, superheat, liquids, etc.

(g) Surfaces (area of) - Heating, cooling, grate, etc.

(h) Viscosities of liquids handled with corresponding temperatures.

(i) Power losses - In same units as (a) and (b).

(j) Heat transfer - Coefficient or rate.

(k) Piping - Friction head on suction at rated flow, pressure drop through.

(ℓ) Boilers - Furnace volume, area through gas passages, uptakes, armor bars, gratings, etc.

(m) Blowers - Area of ducts, intake gratings, armor bars , etc.

(n) Weights - As a whole or per unit, computed or actual , wet and dry.

(o) Power characteristics - Voltage, frequencies, number of phases, type of windings, starting torque, full-load speed torque, percentage of slip, speed adjustment, duty classification, etc.

(p) Characteristic curves - Steam consumption, horsepower, head, pressure, capacities, speed, efficiencies, etc.

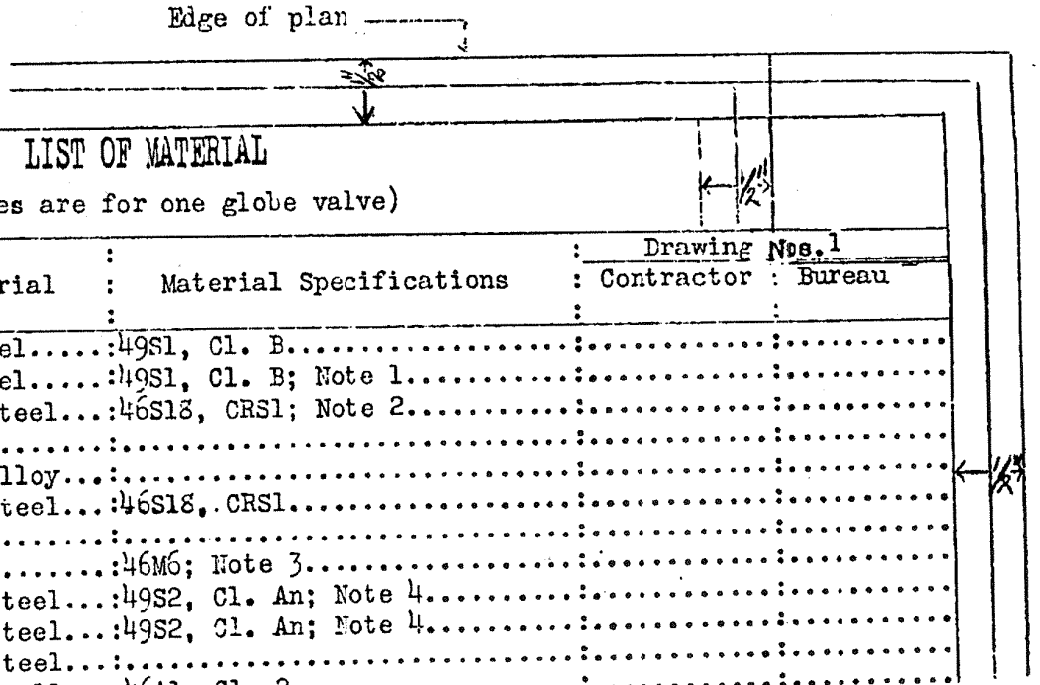
7. Where parts of machinery are indicated as being right-hand or left-hand, a note shall be added to the drawing explaining in detail the difference between the right-hand and left-hand parts. Drawings of screw propellers, in addition to diameter, pitch, developed and projected areas of blades, etc., shall show indicated or shaft horsepower, effective horsepower, revolutions, and speed of vessel for which the propeller has been designed. Drawings of valves and miscellaneous fittings shall show the number, material, and location of each type and size. All drawings of apparatus using tubes, such as boilers, condensers, superheaters, feedwater heaters, etc., shall include a table showing number, ordering length, diameter, thickness, material, etc., of each type and size of tube required; the same applies to special brick in boiler combustion spaces. All apparatus using electric cable or wire shall include a table giving length, size, and insulation of all cable used.

8. Indicating the materials of construction by distinctive crosshatching is not required on any class of drawing; simple line hatching of complete sections or borders of separate parts shall be used wherever necessary to indicate a junction of two different pieces or otherwise to completely clarify the drawing. When distinctive crosshatching is used it shall conform to Bureau of Engineering standard B-20.

9. The materials of construction shall be indicated on a list of material in all cases whether distinctive crosshatching is used or not, and this list shall appear in the upper right-hand corner of a drawing sheet, expanding to the left, and down as necessary. Since, under the provisions of Subsection S1-2, the list of material becomes the medium of agreement between the Bureau and the contractor as to the materials to be employed in construction, it is very important that extreme care be exercised in proper preparation. In order to facilitate Bureau action the following arrangement shall be followed:

Column 1. The piece number. (In numerical sequence 1, 2, 3, etc.)
Column 2. The name of piece.
Column 3. The number required.
Column 4. The material.
Column 5. The specification.

10. In the specification column the Navy Department specification number and class applicable shall always appear for each item considered by the manufacturer to fall in the stressed or otherwise vital class, and so subject to full inspection. Suffix letters, such as the "a" in 43B11a, are not required to identify the particular issue of Navy Department specifications. The identifying number only, "43B11", is necessary. In cases where the manufacturer proposes a substitution, reference to a footnote shall be entered after the Navy Department specification number, and in the footnote the substitution shall be described in sufficient detail as to analyses, tests, heat treatments, etc., as will permit the Bureau to take proper action without further correspondence and in such form that proper inspection can be made. No entry shall be made in column 5 either of specification number or other designation, where the material is nonstressed or nonessential in character. The Bureau, in acting on the plan, will either accept or return this list of material for revision, and having been agreed upon, and approved, the specification column with its footnotes shall serve as the inspecting officer's guide as to whether a full or only a surface inspection shall be applied, see Subsection S1-2. Additional columns will be permitted in the list of material to suit the special requirements of a contractor, but there shall be no omissions from the information called for. The following is a typical list of material for drawings and should be followed in carrying out the above instructions. The width of columns and spacing of lines may be increased over that shown to suit



LIST OF MATERIAL

(Quantities are for one globe valve)

Piece No.	Name of piece	Number required	Material	Material Specifications	Drawing Nos.[1] Contractor	Drawing Nos.[1] Bureau
1	Body	1	Cast steel	49S1, Cl. B		
2	Bonnet	1	Cast steel	49S1, Cl. B; Note 1		
3	Seat	1	Forged steel	46S18, CRS1; Note 2		
4	Disk	1	Nitraloy			
5	Disk nut	1	Nickel alloy			
6	Stem	1	Rolled steel	46S18, CRS1		
7	Nut for pc. 6	1	Bronze			
8	Gland	1	Bronze	46M6; Note 3		
9	Yoke	1	Forged steel	49S2, Cl. An; Note 4		
10	Standard	2	Forged steel	49S2, Cl. An; Note 4		
11	Nut for pc. 10.	2	Forged steel			
12	Hand wheel	1	Aluminum alloy	46A1, Cl. 2		
13	Bonnet stud	8	Steel	43B11, Cl. B		
14	Nut for pc. 13.	8	Steel	43B11, Cl. C		
15	Gland stud	2	Bronze	46B6; Note 5		
16	Nut for pc. 15.	2	Bronze	46B6; Note 5		
17	Split pin for pc. 5	1	Brass			
	SPARES					
3	Seat	1	See above			

[1] These columns, shown in leaders, will only be required for finished drawings where reference to other drawings is necessary.

NOTE 1. - Die-cast carbon steel of following characteristics substituted:

Carbon	.40% max.
Sulphur	.045% max.
Phosphorus	.04% max.

Tensile strength	70,000 lbs. per sq. in. min.
Yield point	35,000 lbs. per sq. in. min.
Longitudinal elongation in 2 inches	25% min.
Transverse elongation in 2 inches	20% min.
Longitudinal reduction of area	40% min.
Transverse reduction of area	35% min.

Cold bend, 180° to inner diameter of 1 inch

NOTE 2. - Cast steel complying with chemical requirements of specifications substituted. No physical test, except minimum Brinell No. 200.

NOTE 3. - Surface inspection only.

NOTE 4. - In accordance with specifications, except minimum tensile strength 90,000 pounds per square inch and elongation 20 percent in 2 inches.

NOTE 5. - Tobin bronze substituted. No test.

11. In order to reduce the number of plans for certain classes of material, such as electrical equipment, switchboards, searchlights, and similar apparatus which are made up of parts and subassemblies that are identical except for minor details or in numbers of parts, additional columns may be inserted to the left of column 1. The number required of the items in column 2 (name of piece) shall be tabulated in these additional columns instead of in column 3. This procedure is ordinarily applicable to plans which have been approved previously for similar apparatus on other vessels and may be used for assembly drawings, subassemblies, or detail parts. Essentially each item in column 2 is identified by means of the additional columns. If an item in column 2 does not apply to the latest design, the space opposite that item in the additional column shall be left blank. If a part is changed, a new item shall be added to column 2 and the number required of the new item shall be indicated in the additional column. If the number required of any items is changed the new number required will appear in the additional column. Each additional column shall show all the items that go to make up the complete unit corresponding to that column. These items may be subassemblies or individual parts, depending on the character of the unit. Plans must be complete, permit ready identification of any part, show all details required for duplication of parts and include all parts which go to make up the complete assembly. An explanatory note shall be added to each plan embodying this procedure that will show clearly which additional columns apply to the particular assembly, subassembly, or detail part on the plan, and the complete unit shall be identified by name-plate serial numbers or other positive means.

12. Surface finish shall be indicated for all parts. Where practicable, Bureau standard symbols and method of indicating them shall be used as described below: where the shop practice of a given manufacturer requires symbols differing from the Bureau's standard, the manufacturer's symbols will be acceptable.

FINISH SURFACE MARKS

f 1. Rough tool finish.
f 2. Fine tool finish.
f 3. Grind.
f 4. Polish.
f 5. Drill.
f 6. Ream.
f 7. File.
f 8. Scrape.
f 9. Spot face.

13. Each piece will be marked with the character of finish required by inserting the corresponding number in the circle, the arrow being placed against the surface to which the finish mark applies. See figure 1.

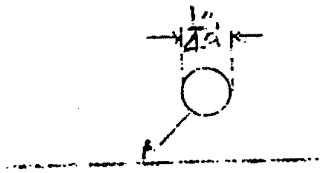


Figure 1.

14. The right-hand side of types B and D drawings shall be reserved for titles, list of material, explanatory notes, etc., and type B and D drawings shall conform to the Bureau's type plan 50-R-87 for arrangement.

15. The titles of all drawings shall be complete, and for all drawings, except type A, shall be preceded by the official designation of all vessels to which the drawing applies, as obtained from the special specifications therefor or from the Bureau; viz, BB45, DD240, etc. As soon as the vessels are named, the name of each vessel shall be added to its official designation wherever it appears. Names and designations of vessels shall be placed on drawings in letters not less than one fourth inch high.

16. Each type D assembly drawing of a set for a given item of apparatus or equipment shall carry a drawing list or index showing all other drawings of the set with identification numbers for ready reference.

17. Where welding is to be used, types A, B, and D drawings shall show welding details clearly and concisely in all important and highly stressed members. For general indications in structural assemblies, the welding symbols of Bureau standard sheet B-154 shall be used; in all such cases, a key to the welding symbols shall be included on the drawing.

Subpar. 18, first sentence, delete and substitute therefor the following two sentences:-

"It is of the utmost importance that the details of the spare parts and special tools to be furnished under any requisition, contract or purchase order be clearly shown on both Type B and D drawings. The details of spare parts and special tools for electrical equipment shall be arranged in a list in conformity with the 'List of Spare Parts and Tools' shown on Subsection S31-1."

pared for ... (79)

accept a modification of the list of material shown under ... graph 10, whereby the columns headed "Number required" may be broken down into two columns, one showing number required for assembly purposes and one showing additional parts to be manufactured for spares; but such information on detail plans shall not relieve the contractor from the responsibility for furnishing a detailed summary of spare parts and special tools on the general assembly drawing or separate special drawing, as the case may require. Final Bureau approval of the spare parts and special tools will be given on the assembly drawing, or special drawing, in each case, and not on detailed drawings. In particular, when sets of spare parts for a particular equipment are called for by the requisition, contract or purchase order, such as 'complete sets of bearings', the summary of spare parts shall show in detail what items constitute a set.

19. In all applications of anti-friction bearings of ball or roller types, the assembly plan of the apparatus shall bear a certificate signed by a responsible representative of the bearing manufacturing company showing that the application of each particular bearing proposed for use is approved by his company as to all details of mounting shown, the load and speed to which the bearing will be subjected and the lubrication of the bearing, giving full consideration to the intended service, viz., continuous or intermittent, ambient temperature, disassembly requirements, etc.

S1-1-b. PHOTOGRAPHIC TRACINGS.

1. Photographic tracings shall be furnished on tracing cloth which is in accordance with Federal Specifications CCC-C-531; white cloth vellum is not acceptable. Photographic tracings shall be right reading and capable of producing a clear and distinct print, and there shall be no distortion nor illegibility of the lines or figured dimensions.

2. Photographic tracings shall be made by an approved photographic process which shall consist of the production of a suitable vandyke negative from the original tracing on special paper; the negative shall then be placed on sensitized tracing cloth and exposed. Following exposure, the tracing cloth shall be passed through a water bath and a developing solution and then carefully wiped clean with cotton or a camel's hair brush to remove foreign or excess substances on the surface.

3. Photographic tracings shall be made with clear, sharp, durable black lines on the dull side of tracing cloth which has been treated with a colorless water-proof coating and sensitized to produce a black line print when exposed under a negative, developed and washed. They shall be of such character as to permit erasures and making alterations in ink with the same facility and degree of permanency as with regular ink tracings. The waterproofing shall withstand at least 20 minutes exposure to water without showing any tendency to break down and shall withstand a sufficient amount of vigorous rubbing necessary to clean out the background without disturbing the lines; breaks, cracks, or spots in waterproofing shall be cause for rejection. The waterproof coat shall adhere to the cloth so that it cannot be stripped from the cloth on either side.

4. The surface of photographic tracings shall be dull mat finish, requiring no top coating or lacquer, and shall possess sufficient tooth to take india ink with the same freedom as natural tracing cloth, and without causing the pen to slip or skip or the ink to spread unduly. The finish shall permit india-ink lines to sufficiently penetrate the surface of the cloth so as to resist removal by chafing with the thumb nail, smudging the lines by damp hands under pressure, and the wear and tear of frequent handling. Failure to withstand the above will be cause for rejection.

5. Photographic tracings shall be perfectly smooth and flat when unrolled and show no tendency to pucker or draw. The background of the cloth after printing and developing shall be of a bluish-white tint having a transparency ratio of not less than 65, and the cloth shall retain as nearly as possible the flexibility of natural tracing cloth. Thickness over 0.0043 inch, stiffness or tackiness shall be cause for rejection.

6. All tracings from which photographic tracings are made shall be in such condition as to produce photographic tracings which are satisfactory in every respect.

S1-1-c. SIZES OF DRAWINGS.

1. The standard vertical dimension when reading all drawings, except types A and C and radio drawings, shall be 27 inches, and the standard length shall be 40 inches, and this standard sheet shall be used wherever practicable. A half size sheet shall be 27 inches in the vertical direction and 20 inches in length, and this size sheet may be used when the standard sheet is not required. If a sheet larger than the standard sheet is essential, the length may be increased as required up to a maximum length of 80 inches. In exceptional cases the vertical dimension may be increased to 40 inches when specifically authorized by the Bureau. For deck arrangements of large vessels and similar plans, where the scale of drawings required to keep within the dimensions of the sheets specified herein, would make the drawing difficult to read, the inspector of machinery may permit the contractor to exceed the length of 80 inches specified, but the number of such sheets shall be kept at a minimum and specific approval of the inspector must be obtained in each instance.

2. Types B and D plans for radio apparatus, shall conform to the following sizes:

(a) "A" sheets, 10-1/2 by 8-1/2 inches.
(b) "AA" sheets, 10-1/2 by 16-1/2 inches.
(c) "F" sheets, 21 by 27 inches.
(d) "J" sheets, 42 by 27 inches.

3. There is no restriction as to the size of types A and C drawings.

S1-1-d. TYPE A DRAWINGS.

1. Type A drawings submitted in connection with bids for the building of vessels shall consist of such sketches and plans as may be necessary to amplify the bureau's original contact plans. Such drawings shall be submitted in duplicate with bids or as required by the invitation for bids.

2. When equipment for vessels is to be purchased directly by the Navy Department, type A drawings in duplicate shall be furnished with the bids, or as may be specifically called for in the schedule or requisitions. In any case one set shall be for the files of the Bureau of Engineering and the remainder filed as directed by the Bureau of Supplies and Accounts. Type A drawings shall consist of all sketches, cuts, drawings, etc., as may be necessary to show completely the character and design of the material or equipment it is proposed to furnish, and in amplification of the description and guarantees described in the wording of the bid.

3. For apparatus such as turbines, pumps, motors, generators, condensers, boilers, and similar units, sectional plans shall be furnished which show clearly the details of the design, the materials of which the units are to be built, the over-all dimensions, and the space required for operation and overhaul.

4. For equipment such as distilling plants, refrigerating plants, and similar installations a floor-plan arrangement shall be furnished showing the space occupied by the apparatus, the space required for operation and overhaul, and the units which make up the plant. Sectional plans of the principal units containing the information required in the preceding paragraph, and such other information as will permit a clear understanding of the plants and their operation shall also be furnished.

5. Award of contract in connection with which type A plans have been submitted does not carry approval of such type A plans as construction or manufacturing plans but they are subject to modification in the development of type B plans as demanded by the requirements of the specifications and terms of the contract.

S1-1-e. TYPE B DRAWINGS.

1. Type B drawings shall consist of preliminary diagrammatic and detail working plans of all machinery and equipment prepared in the development of the contract specifications and shall be submitted for approval via the Bureau's inspector with suitable letter of transmittal for each vessel covered, as soon after award of contract as possible and before work covered by such plans is commenced. Before detail working plans are submitted diagrammatic plans of general arrangement of main and auxiliary machinery, piping, light, power, and interior communication systems must be approved. These drawings shall be carefully checked in order to correct omissions, errors, deviations from form, and noncompliances with the specifications before submission for approval via the Bureau's inspector. When drawings in an unsatisfactory condition in this respect are forwarded in sufficient quantity to constitute a definite cause for delay, the Bureau's inspector shall report the circumstances to the Bureau together with such comment as the contractor may care to make.

2. Type B drawings shall be furnished on blueprints in triplicate where the equipment covered thereby is entirely under the cognizance of the Bureau of Engineering. If other Bureaus are involved one additional copy shall be furnished for each of the other Bureaus concerned. Of the copies furnished, two shall be retained by the inspector and the remainder shall be forwarded by him to the Bureau. Upon receipt of the Bureau's action, one of the copies retained by the inspector will be suitably endorsed by him indicating such action and returned to the contractor. Additional copies offered by the contractor will be similarly endorsed on request.

3. Where two or more vessels of the same class are under construction at the works of the same contractor, or where plans are developed by a central drafting room, type B drawings pertaining to equipment common to two or more vessels shall be submitted as for one vessel and the number of blueprints furnished shall be as directed by the Bureau. In such case drawings shall show name and designation of all vessels covered and letter of transmittal shall give the same information together with contract number of each vessel.

4. Type B drawings may be submitted as tracings accompanied by one blueprint for the files of the Bureau of Engineering and one for the files of any other Bureau concerned. When so submitted contractor shall furnish the Bureau's inspector with one copy for his use, as soon as approved tracing is returned with Bureau's approval.

5. Where type B drawings are taken from tracings previously approved by the Bureau for other vessels, or are tracings made from approved drawings of other builders a note shall be made of Bureau number previously assigned, together with notation "Modified," if modification has been made. If a new drawing is prepared it shall bear a note indicating that it supersedes the previous drawing number.

6. Any alteration made in a type B drawing during the progress of work shall require procedure to obtain approval in the same manner as in the case of the original. Copies of the new or altered drawing, if approval is obtained, shall be supplied as in the case of the original. If alterations are thus authorized and no new drawing is made, the altered drawing shall carry a table of alterations serially numbered and arranged in a table giving date, nature of each alteration, and reference authority for change; such alteration tables shall indicate the character of the original design features which have been altered. The Bureau's inspector shall certify approved alterations as in the case of the original drawing.

7. Two blueprint copies on paper of all finally approved type "B" drawings shall be supplied by the contractor with each vessel delivered to take the place of type D drawings, if the complete set of type D drawings is not ready at time of delivery. One set of such blueprints showing the machinery and electrical installations as finally approved shall be delivered to the Commanding Officer of each vessel via the Inspector of Machinery, and the other set forwarded via the Inspector to the Commandant of each vessel's home navy yard.

8. In the purchase of equipment for vessels directly by the Navy Department, type B drawings shall be furnished for the Bureau's action prior to fabrication of any material, unless the contract specifically states otherwise. In such case the method of procedure shall be identical with that outlined above. The drawings shall likewise be forwarded in triplicate with additional copies for each of the other bureaus concerned, unless the contract states otherwise.

S1-1-f. TYPE C DRAWINGS.

1. Type C drawings shall consist of such drawings as are necessary to amplify information supplied to sub-contractors with purchase orders, copies thereof being required by the Bureau inspectors in making inspection at the works of the subcontractors.

2. Such drawings may be copies of type B plans previously approved or any other form of drawing the contractor may desire to use. Copies of such drawings shall be furnished complete with each copy of the purchase order. All drawings shall be clearly marked to show either shipbuilder's order number or Navy contract number to facilitate identification. Purchase orders are required to be submitted to the Bureau's inspector in quadruplicate. The Bureau's inspector will supply the Bureau and other inspectors at the works of subcontractors with copies as necessary.

3. Purchase orders for steel castings or forgings shall always be accompanied by type C drawings.

S1-1-g. TYPE D DRAWINGS.

1. Type D drawings shall consist of accurate hand tracings in india ink or photographic tracings on tracing cloth for all finished work, and shall be sufficiently extensive in detail to enable parts of the machinery and electrical installation of a vessel to be duplicated without additional drawings, and shall contain sufficient information to permit any part to be readily identified in orders for replacement; for the latter purpose only, photographs mounted on standard size cloth back sheets with part numbers clearly marked thereon will be acceptable to amplify and simplify, but not to replace the regular assembly drawings. (Except as modified under paragraph S1-1-k.)

2. Assembly drawings shall show the name of all major parts of the apparatus or subassemblies which appear on other plans. All clearances affecting the assembling of detail parts shall be clearly indicated, together with any other information required for the proper adjustment of those parts. Any information, not otherwise furnished in instruction books, pertaining to the operation of the apparatus shall be indicated.

3. Where photographic tracings are supplied, reproductions made from the manufacturer's own shop tracings, will, in general, be acceptable. However, whether photographic tracings are made from shop drawing or otherwise, no finished drawings supplied under these specifications shall show any plan or supply any information that is not strictly applicable to the apparatus or equipment for which the drawings are furnished except for certain classes of equipment which are made up of parts or subassemblies, the details of which can be indicated by the procedure specified in subparagraph S1-1-a-9.

4. For equipment which is required to be in accordance with Navy Department Specifications 17C10, 17G7, 17M9 and 17M10, the plans shall conform to the requirements specified therein, except that for type D plans, the number of sets, size, arrangements, title, and form shall conform to the requirements specified herein.

5. When a contractor for a given class of equipment is in doubt as to the character of the type D drawings required by the Bureau, it is suggested that a representative set of drawings covering a characteristic item of equipment be submitted to the Bureau in triplicate for approval. The Bureau will then retain one set of such drawings, and return one corrected set to the contractor, and send one corrected set to the Bureau's inspector having cognizance, for use in checking drawings delivered on contract.

6. All type D drawings shall be furnished complete within four months after a vessel has been delivered by the contractor unless the contract specifically states otherwise.

7. Where two or more vessels of the same design are under construction ~~at the same time~~ by the same contractor, original finished tracings or photographic tracings for the Bureau and for distribution to navy yards are required only as for one vessel, wherever the apparatus covered is identical. If not identical, separate and complete sets of tracings or photographic tracings for the Bureau and for navy yards for all items which differ shall be furnished for each vessel so affected. When more than one vessel is covered by a drawing, the designation, name, and contract number for each vessel to which the drawing applies shall appear thereon.

8. Unless otherwise specified, sets of type D drawings shall be furnished in number and for the purpose indicated as follows:

(a) One complete set of hand tracings or photographic tracings for each vessel or group of similar vessels on order from the same contractor for the files of the Bureau.

(b) ~~Six~~ Seven complete sets as in (a) above to the Bureau's inspector for distribution to navy yards, as directed by the Bureau.

(c) One complete set of hand ~~tracings or photographic tracings~~ for each vessel built containing only the items pertaining to that vessel; this set shall be supplied to the vessel via the inspector of machinery.

9. The type D drawings furnished for the machinery installation and electrical plant shall be indexed by the shipbuilder. Indexing shall be done with india ink and conform to size and style shown on Bureau of Engineering plan 50-R-87. The index number shall correspond to the official designation of the vessel, the group number shall conform to the Navy Filing Manual, and the file number shall conform to the master index sheets for machinery and electrical plans. Where a set of plans applies to a group of two or more vessels, all plans shall be indexed under the lowest numbered vessel of the group; in special cases where plans do not apply to all vessels of the group, such plans shall be indexed under the lowest numbered vessel of that group, and a notation made in or near the title to designate the vessel or vessels to which the plans are applicable. Type D drawings of radio apparatus shall be indexed by the shipbuilder in accordance with instructions furnished by the Bureau on request.

10. The Bureau will supply a set of blank index forms for type D drawings which will be filled in by the shipbuilder with india ink, after which the shipbuilder will make blue-line print copies of these forms for each set of plans; the indexed forms will be forwarded to the Bureau with the set of type D drawings intended for the Bureau's files, and set of blue-line copies will accompany each other set of these drawings.

11. Each set shall be wrapped in a waterproof wrapper and be packed separately, ready for shipment, in flat, strong, wooden cases, in which the sheets shall be so secured that it will be impossible for them to be displaced or crumpled during handling. Sets of machinery, electrical, and radio drawings for the same vessel may be boxed together.

12. In the purchase of equipment for vessels by direct contract with the Bureau type D drawings confroming to the requirements of the above para- Add the following as new subparagraph 13:- ... of the completed

"13. No type D finished plans will be required for the interior communication quipment listed in subparagraph S1-1-h-6(ℓ)." (74)

S1-1-h. INSTRUCTION BOOKS AND PAMPHLETS.

1. Instruction books will be furnished by contractors and subcontractors for main propelling machinery, boilers, air compressors, forced draft blowers, ~~reciprocating pumps~~, centrifugal pumps as required by Subsection S47-2, positive displacement rotary pumps as required by Subsection S47-3 and other auxiliary machinery, electrical installations and other important naval equipment furnished by them. These instruction books will contain all necessary pertinent information to insure efficient and economical use of the equipment, such data and information as may be required by the applicable specifications under which furnished, and in general, the following:-

(a) General Description, including also sufficient sketches, illustrations, and sectional assemblies with appropriate references to drawing numbers and titles.

(b) Installation instructions.

(c) Operating instructions.

(d) Instructions for care and maintenance.

(e) Safety precautions.

~~(f) Spare parts lists.~~ prchg no. 71

(F) Index.

...books will be printed on a strong grade of paper ... S1-1-h-6(ℓ) reproductions of approved type B plans."

(3) For interior communication equipment listed in subparagraph

2. The instruction books shall be covered with a strong durable cover of black leather, leatherette, fabrikoid or similar approved material and shall be bound securely so as to prevent detachment of either the covering or the pages. The size of the cover shall be approximately 9-inches x 11-inches. The front cover shall contain the following information:

(a) Sufficient descriptive data to enable ready identification.

(b) Name and number of all vessels to which the equipment applies.

(c) Contract numbers under which equipment was purchased. If more than one contract number is shown, the vessels supplied under each contract shall be indicated.

(d) Manufacturer's name and address.

A sample of the complete book shall be submitted to the Bureau for approval before final printing.

3. A contractor furnishing more than one set or type of equipment, subject to Bureau approval, may incorporate the instruction books of similar or allied equipment in one binder, providing the binder does not become bulky and more difficult to use.

4. The Bureau will consider requests by contractors in special cases to furnish descriptive pamphlets instead of instruction books. Such pamphlets shall contain sufficient information to insure that the operating personnel can operate and maintain the equipment properly. The pamphlets shall be bound in a durable cover as described in subparagraph 51-1-h-2 above.

5. All copies of instruction books required shall be delivered to the inspector of machinery prior to the delivery of each vessel. Sufficient copies shall be supplied for distribution by the inspector of machinery as follows:

(a) Five to the Bureau of Engineering.

(b) Ten to the commanding officer of each vessel, in the case of battleships, cruisers, and aircraft carriers, and five for each other type of vessel.

(d) Six books relating only to submarine equipment to the Commander, Submarine New London, Conn. for the Submarine School.

(c) Two to the Superintendent of the United States Naval Academy.

(e) In the case of vessels built at Navy Yards additional books shall be furnished as follows: (1) Two for Central Drafting Office, Brooklyn, N.Y.; (2) Three for each building yard.

6. Instruction books shall in all cases be furnished for the following equipment listed in subparagraph 51-1-h-6(ℓ) to each navy yard.

"(f) Two of (74)

(a) Electrical propulsion equipments for all classes of vessels.

(b) Oil engines of all types, whether for propulsion purposes or not.

(c) Gasoline engines of all types.

(d) Main propulsion turbines.

(e) All turbines for driving electric generators.

(f) Propulsion reduction gears.

(g) Oil-burning equipment.

(h) Distilling plants.

(i) Refrigerating plants and boxes.

(j) Storage batteries, submarine propulsion.

(k) All auxiliary machinery of new or unusual design.

(ℓ) Interior communication equipment:

(1) Electric clocks.
(2) Telegraph systems.
(3) Battle telephones.
(4) Sound-powered telephones.
(5) General announcing telephones.
(6) Electric log.
(7) Shaft-revolution indicator system.
(8) Fire-alarm system.
(9) Salinity indicator system.

S1-1-i. RECORD OF ELECTRICAL INSTALLATION.

1. Complete information and illustrative matter in connection with the details, layout, test, and operation of all the electrical equipment of a vessel shall be complied by the contractor and bound by him into a convenient record of the electrical installation; information concerning radio equipment, and the underwater sound system shall not be included, except items connected with the power supply therefor, such as motor generators, etc. Arrangements to include information concerning items of the electrical installation not under the cognizance of the Bureau of Engineering shall be made by the contractor with the assistance and to the satisfaction of the inspector of machinery.

2. In general, the material included shall contain full information in regard to general appearance, details of construction, operation, connections, maintenance, shop test data, and shipboard test data (for standard test forms for electrical tests, see Appendix I) of all electrical machinery, instruments, fittings, appliances, etc., except such as may be covered by Bureau standard plans and those excepted by subparagraph 1. For illustrative purposes, blueprints, photographs, cuts, or other suitable reproductions may be used and these shall be properly numbered or lettered to accompany the text; scales shall not be reduced to a size which would render reproductions difficult to read. Every type of instrument employed in the interior communication and signal systems, as well as generators, motors, controllers, searchlights, rheostats, circuit breakers, storage batteries, switchboards, panels, switchboard instruments, etc., shall be included, with the manufacturer's instructions, testing

ethods, nomenclature, catalog designation, and ordering instructions therefor. lementary wiring diagrams shall be included in conjunction with other description nd test data for electrical installations. Descriptions and plans of items urnished by the Government shall be obtained from the Bureau concerned by the ontractor and included in the final compilation.

3. All matter as finally compiled shall be grouped and carefully indexed; the rouping shall be on general lines, as, for example, (a) general, (b) distribution, (c) power, (d) lighting, (e) interior communication, (f) signals, (g) torage batteries, etc. The text may be printed or multigraphed and extracts rom manufacturer's catalog covering the apparatus concerned may be bound directy in the record if of convenient size.

4. Fourteen copies of the record shall be prepared and all copies shall be elivered to the inspector of machinery prior to the delivery of each vessel for istribution as follows:

(a) Five copies to the Bureau of Engineering.

(b) Five copies to the commanding officer of each vessel.

(c) One copy to the Bureau of Construction and Repair.

(d) Two copies to the Bureau of Ordnance.

(e) One copy to the Bureau of Navigation.

5. Any original tracings or extra copies of subject matter specially prepared for the record by the contractor, shall be finally forwarded to the Bureau of Engineering.

Subpar. 4, delete, including subs (a), (b), (c) and (d), and substitute therefor the following:-

"4. All copies of the record shall be delivered to the Inspector of Machinery prior to the delivery of each vessel. The records shall be grouped into volumes for distribution on the following described basis:

"Record of Electrical Installation

"VOLUME I - Description.

"NOTE 1. This shall include all of the required information and illustrative matter.

"NOTE 2. This volume may cover a group of vessels when the matter is common to all the vessels of a group." (70)

"VOLUME II - Record of Electrical Tests.

"NOTE 1. This shall include blueprint copies of all of the required authenticated electrical tests' records - factory, supplementary factory and shipboard - of the electrical driven

2. After all copies have been made the original tracings prepared for the booklets shall be forwarded to the Bureau for its files.

3. Drawings for the booklet plans of machinery shall be submitted to the Bureau for approval before final tracings. The final form of the drawings supplied shall be as finished tracings on cloth, in sheets 14 inches by 34 inches with a 1/2-inch margin all around, except on the left edge where a margin of 1-1/2-inches shall be left for binding. No more than one system shall be shown on any sheet, and each system shall be complete. All valves, branches, and connections to main and auxiliary machinery and equipment shall be shown.

4. Drawings shall be clear and distinct and shall show leads of all piping connections and in skeleton diagrammatic arrangement. Copy of Bureau's standard drawing may be requested as indicative of what is required. (See Bureau type plan 6-Y-374). At least one tracing showing each of the following systems and connections as installed in plan, and one showing each as installed in elevation shall be furnished. Certain systems may be shown for each deck if desirable.

For all vessels, except submarines:

(a) Main and auxiliary steam piping.
(b) Boiler feed; suction, discharge, and make-up feed piping.
(c) Auxiliary exhaust piping.
(d) Fresh-water tanks; filling and suction piping.
(e) Fire and bilge; suction and discharge piping.
(f) Distilling plant; all piping.
(g) Refrigerating plant; refrigerant, brine, and water piping.
(h) Steam heating plant; steam and drain piping.
(i) Pantry, galley, laundry, and bath; fresh-water supply; steam and drain piping.
(j) Low-pressure steam drainage; piping and traps.
(k) High-pressure steam drainage; piping and traps.
(l) Main turbine glands; steam supply, leak-off piping, and steam-leakage-recovery system.
(m) Main propelling machinery; lubricating oil supply return and purification system.
(n) Lubricating oil tanks; filling and suction piping.
(o) Sea valves; suction and discharge connections.
(p) Compressed air; deck and machinery supply system.
(q) Fuel oil; tank filling and suction piping.
(r) Fuel oil; tank heating system, complete.
(s) Fuel oil; burner supply piping to boilers, galley incinerator, and other special services.
(t) Electric cable, electric-propulsion arrangement; generators via control station to motors, excitation, and control systems.
(u) Electric-propulsion switching system.
(v) Ventilation piping; supply and exhaust for machinery spaces.
(w) Such other additional systems as the Bureau may specify in the individual case.

NOTE.- For destroyers and other small types of vessels where any of the above enumerated systems are not extensive, two or more can be combined and shown on the same sheet if convenient.

5. For heavy-oil engine installations (submarines), items d, f, g, h, i, n, o, q, s, t, and u shall be furnished as given in the foregoing subparagraph and the following additional items:

(a) Forced lubrication and piston cooling; supply, return, and purification system.
(b) Compressed air; scavenging, supercharging, and starting system.
(c) Compressed air; ship's high-pressure system.
(d) Compressed air; ship's low-pressure system.
(e) Automatic fuel compensating system.
(f) Main and auxiliary water systems.

6. In addition to the foregoing plans, general data for all vessels shall be supplied made up on a similar tracing, and a general synopsis of the official contract trials. The latter will be furnished to the contractor by the Bureau, via the inspector of machinery. The general data required shall include the following items, covering dimensions and outstanding characteristics:

(a) Hull.
(b) Propelling machinery.
(c) Shafting and bearings.
(d) Propellers.
(e) Boilers.
(f) Pumps.
(g) Auxiliary machinery.
(h) Condensers and vacuum equipment.
(i) Lubricating oil capacity and storage.
(j) Fuel capacity and storage.
(k) Fresh-water capacity and storage.
(ℓ) Speeds and performance characteristics on official trials.

S1-1-k. TYPE B AND D DRAWINGS - LIST OF PLANS.

1. In order to obtain uniformity in the preparation of type B, and particularly type D, drawings, the following lists of subject items for such drawings are given. For certain vessels some items listed do not apply; for others, necessary items may have been omitted. The lists are not intended to be exhaustive but are furnished only as a general guide; omission of any important item shall not be construed to relieve the contractor of the responsibility for furnishing either type B or type D drawings, pertaining to same if required. It is understood that these items are meant to include only work which is under the cognizance of the Bureau of Engineering.

2. For the following items, arrangement or assembly drawings will be required with such detail drawings or information as are necessary for a clear understanding of the item and to permit reproduction of parts which are subject to wear or breakage and which may require replacement. The details of parts may be made on the same sheet as the arrangement or assembly plan, may be in the form of a descriptive note or may be on one or more separate sheets.

(a) Bilge drainage system, machinery spaces.
(b) Blacksmith shop.
(c) Feed regulators.
(d) Fire extinguishers, machinery spaces (steam).
(e) Floor plates, machinery space.
(f) Forced-draft system.
(g) Foundations, important machinery.
(h) Foundry.
(i) Gear, locking, main and bilge injection, distance, valve operating.
(j) General workshop.
(k) Gratings, machinery spaces.
(l) Guards, main propulsion units.
(m) Heating system:
    (1) Steam, living spaces.
    (2) Coils, fuel-oil tanks.
(n) Indicators:
    (1) Temperature.
    (2) Fuel-oil tank gage.
    (3) Smoke.
(o) Ladders, machinery spaces.
(p) Lagging and heat insulation.
(q) Oil purification apparatus.
(r) Piping.
(s) Protective devices, electric propulsion controls.
(t) Shop arrangements.
(u) Sirens, steam.
(v) Smoke pipes.
(w) Switching structure, electric propulsion control.
(x) Tanks, air.
(y) Trial equipment.
(z) Uptakes, boiler.
(aa) Valves.
    (1) Sentinel.
    (2) Sluice, gate.
(bb) Ventilating system, machinery spaces.
(cc) Whistles, steam and electric.

3. For the following items, assembly and complete detail plans will be required:

(a) Air accumulators:
    (1) Compressors.
    (2) Ejecting apparatus for condensers.
    (3) Flasks and plugs, Diesel engines.
    (4) Starting and reversing gears, Diesel engines.
(b) Augmenters, vacuum.
(c) Bearings:
    (1) Main shafting.
    (2) Main thrust.
    (3) Turbine thrust.

(ee) Mandrels for white metal, main bearings.
(ff) Manifolds and all important piping.
(gg) Meters, torsion.
(hh) Micrometer gear, main propulsion units.
(ii) Motors, electric propulsion.
(jj) Mufflers, exhaust, Diesel engines.
(kk) Oil fuel system.
(ll) Packing:
    (1) Gland:
        (a) Auxiliary turbine.
        (b) Main turbines.
    (2) Metallic, main engines.
(mm) Potheads, propulsion cables.
(nn) Propellers.
(oo) Pumps.
(pp) Reduction gear, main propulsion units.
(qq) Refrigerating plant.
(rr) Relays, electric propulsion control.
(ss) Rheostats, electric propulsion control.
(tt) Separators:
    (1) Oil.
    (2) Steam.
(uu) Shafting, main propulsion.
(vv) Strainers:
    (1) Kacomb.
    (2) Oil.
    (3) Steam.
(ww) Stuffing boxes:
    (1) Bulkhead:
        (a) Pipe.
        (b) Shaft.
    (2) Main engine.
    (3) Stern tube.
(xx) Switchboards, electric propulsion control.
(yy) Switches, electric propulsion control.
(zz) Tanks:
    (1) Air.
    (2) Feed and filter.
    (3) Ice making.
    (4) Oil.
(aaa) Tools, special.
(bbb) Transformers, electric propulsion.
(ccc) Turbine, special control, main propulsion units.
(ddd) Turbines:
    (1) Auxiliary.
    (2) Main propulsion.
(eee) Valves:
    (1) Boiler blow.
    (2) Check.
    (3) Feed stop and check.
    (4) Composition gate above 2-1/2 inches (where not standard).

(d) Blowers:
  (1) Ventilating, electric propulsion equipment.
  (2) Forced draft, fire rooms.
  (3) Soot.
(e) Boilers:
  (1) Auxiliary.
  (2) Main.
(f) Bolts, holding down, main propulsion units.
(g) Cables, electric-propulsion units.
(h) Circuit breakers.
(i) Clocks, electrical.
(j) Clutch gear, main propulsion.
(k) Condensers.
(l) Coolers.
  (1) Air.
  (2) Oil.
  (3) Water.
(m) Distilling plant and auxiliary equipment.
(n) Eductors.
(o) Engines, main propelling.
(p) Expansion couplings, shaft.
(q) Expansion joints for piping.
(r) Fair-waters.
(s) Filters, lubricating oil.
(t) Gages:
  (1) Bridge.
  (2) Turbine clearance.
(u) Gear, lifting:
  (1) Lifting, for important machinery.
  (2) Operating:
    (a) Main engines.
    (b) Smoke pipe.
    (c) Damper.
    (d) Valve.
  (3) Turning or jacking, main propulsion units.
(v) Generators, main propelling.
(w) Governors:
  (1) Auxiliary units.
  (2) Main propulsion units.
(x) Grease extractors.
(y) Heaters:
  (1) Water.
  (2) Oil.
(z) Indicator gear:
  (1) Auxiliary units.
  (2) Main engines.
(aa) Indicators:
  (1) Revolution.
  (2) Salinity.
(bb) Insulators, electric propulsion cable.
(cc) Interlocks, electric propulsion.
(dd) Lubrication:
  (1) Auxiliary units.
  (2) Main propulsion units.

(5) Composition globe, angle and cross above 2-1/2 inches (where not standard).
(6) Injection.
(7) Reducing or regulating.
(8) Relief.
(9) Safety, boiler.
(10) Sea.
(11) Spring-loaded or pressure-regulating, exhaust.
(12) Stop, boiler.
(13) Throttle.
(14) Toggle operated stop and cut out valves in the main steam lines.

4. For certain classes of equipment, such as those where mechanical fit is not an object, where it may be manifestly impracticable for the manufacture of replacement parts to be attempted by naval personnel, or where the item in question is in accordance with approved naval standards or so standardized industrially as to be readily obtainable by pruchase in practically any United States port, types B and D drawings in the form specified above will not be required. In lieu of hand tracings or photographic tracings, however, sufficient information shall be supplied by photographs, illustrations, printed matter, etc., to enable the equipment in question to be readily understood and to permit all parts to be ordered for replacement. The following list of items is given as indicative of equipment covered in this subparagraph:

(a) Bolt forcers.
(b) Calorimeters.
(c) Chain blocks.
(d) Cleaners, tube.
(e) Clocks, nonelectrical.
(f) Counters, revolution.
(g) Electrical metering instruments, switchboard and portable.
(h) Flue-gas analyzing outfits.
(i) Fuses.
(j) Gages (steam, vacuum, air water, and oil) except special types.
(k) Indicators:
    (1) Diesel engine.
    (2) Steam engine.
(ℓ) Instruments, electric propulsion.
(m) Joints, universal.
(n) Machine tools (except motors and other electrical equipment).
(o) Meters:
    (1) Oil
    (2) Water.
(p) Pipe fittings.
(q) Pyrometers.
(r) Springs.
(s) Thermometers.
(t) Transformers, instruments.
(u) Tools:
    (1) Hand (except special wrenches, etc.).
    (2) Machine (except motors and other electrical equipment).
    (3) Workshop.

(v) Traps, except vacuum traps for turbine drainage.
(w) Valves:
(1) Made from Bureau standard plans, Navy Department leaflet specifications, or Supplementary General Specifications, except toggle operated stop and cut-out valves in main steam line.
(2) Composition gate, globe, angle and cross, 2-1/2- inches and under.

5. The following items for plans of electrical installation of vessels are listed to be furnished by the contractor:

(a) Power system:
(1) Elementary diagram of power distribution system (refer to type and contract plans - see also subparagraph S1-1—k-5(e)(1).
(2) Electrical data for motor driven auxiliaries (standard form, Bureau drawing 9-S-4729-L).
(3) Power analysis and summary of feeders (standard form for A.C. Bureau drawing 9-S-4704-L - see also subparagraph S1-1-k-5-g(5)).
(4) Isometric wiring diagram of Battle and General systems.
(5) Isometric wiring diagram of Emergency system (including portable storage battery leads and charging circuits.
(6) Isometric wiring diagram of bus ties, switchboard interconnections, generator cables, shore connections, transformers and feeders for ships alongside (tender class), etc.
(7) Elementary diagram of vent sets power and control, and vent system closures and control.
(8) Elementary diagram of electric furnace power and control.
(9) Elementary diagram of all systems of remote control of circuits.
(10) Elementary diagram of control and starting circuits of emergency generator starting.
(11) Isometric diagram of heating, starting and radio testing installations.
(12) Elementary of control, interlock and indicating connections between switchboards.
(13) Isometric wiring diagram of power circuits in gun turrets and mounts.
(14) Isometric wiring diagram of cable leads for main propulsion - (also an elementary wiring diagram).
(15) Working wiring deck plans.
(16) List of feeders and mains of Battle, General and Emergency systems (standard form Bureau drawing 9-S-4746-L).
(17) List showing switch arrangements, loads, fusing, etc., of distribution panels.
(18) Summary list of all storage batteries on vessel showing charging arrangements.
(19) Complete list of transformers with load data.

(b) Lighting system:
(1) List of lighting fixtures and appliances with symbols (standard form, Bureau drawing 9-S-4905-L - see also subparagraph S1-1-k-5-b(15)).
(2) Isometric wiring diagram of Battle and General systems.
(3) Isometric wiring diagram of Emergency system.
(4) Outline plan of vessel showing exact locations of all searchlights, running, anchor and signal lights.
(5) Elementary wiring diagram of running, anchor and signal lights.
(6) Isometric wiring diagram of running, anchor and signal lights.
(7) Isometric wiring diagram of lighting circuits in gun turrets and mounts and torpedo mounts.
(8) Plan showing locations of all flight deck lights.
(9) Elementary diagram of circuits of all flight deck lights.
(10) Elementary diagram of control of all flight deck lights.
(11) Elementary diagram of control of hangar deck lighting.
(12) Elementary diagram of remote control of general lighting.
(13) Working wiring deck plans.
(14) List of feeders and mains of Battle, General and Emergency systems (standard form, Bureau drawing 9-S-4745-L).
(15) List showing switch arrangements, loads, fusing, etc., of distribution panels.
(16) Load, analysis and summary of feeders (standard form for A.C. Bureau drawing 9-S-4704-L - see also subparagraph S1-1-k-5-a(3)).
(17) Summary of lighting system equipment (standard form, Bureau drawing 9-S-4905-L - see also subparagraph S1-1-k-5-b(1)).
(18) Illumination survey data (standard form, Bureau drawing 9-S-4901-L).

(c) Interior Communication and Fire Control Systems:
(1) Elementary wiring diagram of each interior communication system. The government will supply type B and type D plans of elementary wiring diagrams of self-synchronous fire control circuits.
(2) Isometric wiring diagram of each interior communication and fire control system.
(3) List of voice tube outlets.
(4) List of telephones (battle, sound powered, automatic, general announcing)
(5) Diagram of current supply.
(6) Load summary of all circuits emanating from interior communication switchboards.
(7) Deck plans (1/4-inch scale on surface ships, 3/8-inch scale on submarines): separate sets of plans for interior communication and fire

(3) Storage battery compartment and arrangement of battery charging station.
(4) Arrangement of electrical workshop.
(5) Steering gear room.
(6) Turrets and mounts.
(7) Turret.
    (a) Column and base.
    (b) Castings.
(8) Torpedo tubes.
(9) Torpedo rooms.
(10) Refrigerating plant spaces.
(11) Machinery spaces.
(12) Boiler rooms.
(13) Motor rooms.
(14) Bridge.
(15) Central station.
(16) Chart house.
(17) Conning tower.
(18) Armored access and wiring tubes.
(19) Control rooms.
(20) Maneuvering rooms.
(21) Fire control and director stations.
(22) Gyro rooms.
(23) Interior communication room.
(24) Cable installations at exposed guns and directors.
(25) Masts.
(26) Pilot house.
(27) Plotting rooms.
(28) Photographic laboratory.

(e) Miscellaneous.
(1) Schedule of Type B plans of electrical installation - This schedule shall consist of a tabulation of the plans required of the electrical installation of the vessel or vessels concerned; listing in parallel columns: (a) the titles; (b) the contractors plan numbers (with column for alteration numbers); (c) the Bureau of Engineering plan numbers (with column for alteration numbers); (d) the estimated date of submission for approval and (e) remarks; additional columns may be added to suit the contractors convenience.
(2) A plan listing all methods of supporting cables, fixtures, panels, appliances, etc., by Bureau plan, alteration and method numbers as used; and delineating any proposed methods which are departures from the Bureau standard methods. Also plans shall be furnished of any nonstandard (special) fixtures and appliances used.
(3) Diagrammatic wiring plan of power and lighting systems and diagram of connections of generator and distribution switchboard as required for proper care and operation of the electric plant. (Copies also to be suitably framed and fitted on each generating set platform) (Refer to subparagraph S1-1-k-5-a(1)).
(4) List of electrical weights showing manufacturer's or contractor's drawing numbers, Bureau drawing numbers, quantity, unit weights, and total weights, in pounds, of all electrical material installed, whether furnished by the contractor or Bureau. (Bureau standard form, Bureau drawing 9-S-3617-L).

(f) All Electrical Apparatus and Equipments.
(Refer to detail requirements of applicable Subsections of General Specifications for Machinery, Supplementary General Specifications for Machinery and Navy Department leaflet specifications).

S1-1-ℓ. ELECTRICAL PLAN REQUIREMENTS.

1. Plans showing runs of wire leads and structural work together shall have the wire leads shown as heavy lines, and structural work (outlines of decks, bulkheads, etc.) in light lines.

2. All working deck plans and general arrangement plans showing electrical wiring, shall have all structural work shown (such as doors, hatches, sky lights, stanchions, coal chutes, man holes, removable plates, together with their names and compartment numbers, etc.) which might in any way affect the run of the electrical wireways.

3. The symbols used on plans to indicate types of appliances, fixtures, etc., shall be in accordance with Bureau of Engineering standard plan 9-S-3744-L. Each plan on which appliances, fixtures, etc., are shown by a symbol, shall for convenient identification, and shall have on it a table which shall show in parallel columns each symbol used with its name and/or descriptive identification; this applies in particular to isometric and working wiring deck plans. All cables shown on plans shall be identified in accordance with Subsection S28-2. Where Bureau standard forms are available they shall be followed in the preparation of plans.

4. Working wiring deck plans shall be of 1/4-inch scale on surface vessels and 3/8-inch scale on submarines; or larger as required for satisfactory legibility. These plans shall be submitted after diagrammatic (elementary and isometric) plans have been approved, and shall show the proposed location and type of fixtures, approximate location of motors and motor generators, fans, I.C. instruments, and all other electrical apparatus, complete wiring, nature of wireways, and all appliances, such as feeder junction boxes, feeder distribution boxes, distribution boxes, switches, receptacles, etc.

5. Each system wiring plan shall have a reference plan table referring to all other plans of the system (this includes elementaries, isometrics, deck and feeder lists); this table shall list in parallel Engineering numbers and alterations of each. In the case of deck plans, one of the decks(preferably Hold-Ford) only, shall bear the list of reference plans and their respective alteration numbers - in case of alteration to one of the system plans, it will therefore be necessary only to change the alteration numbers of reference plans on only this single deck plan.

6. The schedule of plans of electrical installation and the elementary diagram of the power distribution system shall be submitted at the earliest practicable date after award of contract. All power systems, lighting system and general plans as listed in subparagraph S1-1-k-5 shall be submitted for approval in the general order stated in that subparagraph.

7. On elementary and isometric wiring diagrams and on deck plans, the extensive use of single lines to represent several cables, is unsatisfactory; a limited use of single lines for this purpose will be satisfactory. However, this shall be limited to instances where a group of leads start at one point (as at a panel or terminal board) and all proceed in the same direction to end in one general vicinity - and in these instances there should be no branches off the main single line run; wherever the single line scheme is used the leads shall be carefully labelled at each end of the single line where they are again separated.

8. All interior communication plans shall be submitted for approval in the order stated in subparagraph S1-1-k-5 and on separate sheets. One system only shall be shown on a sheet. Additional plans which may be necessary to show special features or points not otherwise clear shall be submitted as required. Deck plans shall show general arrangement and wireways, including location of junction boxes, distribution boxes, and other principal wiring appliances. There shall be furnished sheets containing general summary of the interior communication instruments, accessories, and wiring appliances, giving both contractor's and Bureau drawing numbers.

9. The diagrams on lists of lighting feeders and mains shall show the number of each and every circuit and circuit section (feeders, mains, submains and branches). In this numbering care must be exercised in order to leave numbers available in sequence for each spare connection in a box (each spare on a box should be shown by a stub line). Also the deck plans shall show the number of each circuit (feeders, mains, submains and branches) which passes through a deck, bulkhead, or barrier or out of the same compartment from which it is fed; refer to Subsection S38-2. This marking is intended to provide proper identificaction of the circuits, so as to facilitate the tracing of the circuit after installation.

10. The approved type B plans of the electrical installation shall be followed in making the actual installation except as modified by this paragraph and any major developments or deviations therefrom - which are approved locally by the Inspector of Machinery or the Navy Yard - shall be accompanied by immediate alteration of the approved type B plans involved to show such departures. By major developments or deviations is meant changes which if not shown would lead to confusion in checking or tracing a circuit or fittings. Since the installation as actually made will be in strict conformity with and shown in all important details on the type B plans, which will thus include all such major developments and alterations made and approved by local authority, it is contemplated that new tracings made of such type B plans will be furnished as the type D drawings required under paragraph S1-1-g. It shall be noted in particular, that on this basis it will not be necessary to make wiring deck plans from the work to show exact locations of cables, fixtures, etc. - it being considered sufficient that the wiring installation plans shall have cables, fixtures, appliances, etc., shown in the proper compartments in their approximate locations, irrespective of exact location, as is the case on the type B plans. No type D finished deck plans will be required of the interior communication and fire control systems. Where one set of type D finished plans are furnished for more than one vessel of a group, all major departures for any individual vessel or vessels shall be clearly indicated by notes on the basic plan, or by such supplementary plans as may be necessary if such departures are extensive.

S1-1-m. RADIO DRAWINGS, SPECIAL REQUIREMENTS.

1. Type plans drawings of radio apparatus and its arrangements will be supplied by the Government from which contractors shall make the installations.

2. In cases when contractors supply radio apparatus, working drawings shall be submitted as may be required by the Bureau of Engineering, in the standard sizes shown in subparagraph S1-1-c-2.

S1-1-n. SYMBOLS FOR ELECTRICAL INSTALLATION OF VESSELS.

1. Symbols used on drawings to indicate type of appliances, etc., shall be in accordance with Bureau of Engineering plan No. 9-S-3744-L, revised to date of bid.

S1-1-o. INSPECTION AND PERFORMANCE ACCEPTANCE TESTS.

1. Unless otherwise specified, the inspections and tests made in accordance with the requirements of the applicable specifications shall be recorded in a complete test report as hereinafter stated. These reports may be made on manufacturer's or contractor's test forms, except when Standard Forms, (See Appendix I) have been prepared by the Bureau.

(For remainder, see shts. 1 and 2 of changes attached.)